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Discriminability of Tactual Patterns[1]

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This study is part of an effort to determine an adequate tactual symbolism for the blind which could be used graphically in combination with Braille. Braille, which is highly developed and standardized, fills the requirement for embossed verbal communication. However, means available for embossed graphic communication, i.e. through maps, graphs, charts, and diagrams, are still relatively crude. Lack of identification of clearly discriminable tactual symbols and lack of knowledge of factors that determine tactual figure-ground relations have seriously impeded development in this area.

Three types of symbols; areal, linear, and point, are needed for graphic communication. The number of discriminable tactual symbols possible in any given size appears dependent upon the medium in which the symbols are reproduced. For example, the number of small symbols which can be reproduced through embossing paper is extremely limited. In a previous study Heath (1958) explored the usefulness of Virkotype printing for the reproduction of tactual graphics and successfully identified discrete tactual symbols for area. However, methodological problems restricted the number of discrete symbols identified to below an acceptable minimum. The present experiment was set up as an extension of Heath's.

The purpose of this study was to test empirically a group of twelve areal type tactual patterns, reproduced in Virkotype, for discriminability and to test whether any difference exists in the ability of blind children to discriminate these patterns as related to their grade placement, sex, IQ, or chronological age.

METHOD

Subjects

Ninety-six legally blind students, grades 4-12, from the Missouri School for the Blind and the Illinois Braille and Sight-Saving School served as subjects. These were selected so that there were 12 boys and 12 girls from each of the following grade groups: 4th and 5th; 6th and 7th; 8th and 9th; 10th, 11th, and 12th.

No subject was used from grades below the fourth as a previous study (Nolan, 1960) had indicated that children's ability to make tactual discriminations does not fully develop until they are in about the fourth grade. The subjects were all Braille readers who were doing adequate classroom work.

Experimental Materials

Twelve tactual patterns were printed in Virkotype which utilizes a plastic ink to achieve a high embossed effect. Some of these were those Heath had found discriminable, while the others were selected visually in terms of their being different from any of the Heath group. Each pattern was reproduced on a 2 inch square centered on paper 2½ x 4 inches. These were systematically assembled in a paired-comparison arrangement and mounted on 5 x 8 inch cards. The right-left positions of the patterns were varied deliberately so that each pattern would appear an equal number of times on either side. The pairs were then randomly assigned their ordinal positions and numbered accordingly. The entire set was comprised of 78 stimulus cards, each pattern being compared once with itself as well as once with each of the other eleven patterns. The test was preceded by two sample items, one displaying like patterns and the other unlike patterns.

Experimental Design

The test was administered to each subject individually. A one-minute maximum time limit was stipulated for each test item. This proved more than adequate.

Those subjects who had enough residual sight to visually perceive the stimuli were blindfolded. The stimulus cards were presented with the two patterns to be oriented in a horizontal position. The subjects were permitted to use either or both hands and to examine the stimuli at will. Subjects were required to judge whether the pair of stimuli on each card was "alike" or "not alike".

RESULTS AND DISCUSSION

The mean correct discriminations and standard deviations for each group are presented in Table 1. The average score for the entire group was 69.2 (out of a possible 70) with a standard deviation of 5.09. The 6th and 7th grade group had the most variable scores while the 10th, 11th, and 12th grade group had the least variable as indicated by their standard deviations.

Insert Table 1 about here

Results of an analysis of the differences of the means for the groups, ordered by grade and sex, showed that neither of the main effects or the grade x sex interaction was significant at the 5% level of confidence. These results are presented in Table 2.

Insert Table 2 about here

The correlation of the subjects' G. A. with their correct scores yielded a product moment coefficient of correlation of .15 which is not significant at the 5% level of confidence. The correlation of the subjects' IQ scores with their correct scores yielded a product moment coefficient of correlation of .30. This is significant at the 1% level of confidence.

In determining the more discriminable patterns, it was stipulated that a pattern would be regarded as "indiscriminable" if it was confused with any other pattern or itself on 10% or more comparisons. As only five of the tactual patterns used proved discriminable this study was later repeated using different subjects and different areal patterns for the six poorer stimuli. The [illegible] pattern was retained in the subsequent study. Using the same criterion of discriminability as was here used, eight patterns were found to qualify. These patterns are illustrated in Figure 1.

Insert Figure 1 about here

Errors made on the "alike" responses were compared with those made on the "not alike" to determine whether the subjects had acquired a set for saying "not alike" as the latter was the correct response 11/1 times. The percentage of errors proved to be the same, 3.3%, for the two different responses. In view of this, it is not believed that the subjects subjectively established a "not alike" response set for their responses.

In order that these areal patterns be used for graphic purposes, it will be necessary to find point and line symbols that can be used with them. As C. A., sex, and grade placement have no significant effect on a student's ability to distinguish tactual patterns, products made from Virkotype appear equally useful to students of different ages, sexes, and in different grades.

SUMMARY

Using the method of pair-comparison, ninety-six legally blind students judged the discriminability of twelve tactual patterns. Five patterns were identified as highly discriminable. An identical subsequent experiment led to the identification of three additional discriminable patterns, for a total of eight. Ability to discriminate tactual patterns was not related to sex, grade, or chronological age, but did appear slightly related to intelligence.

References

Heath, W. R. Maps and graphics for the blind: some aspects of the discriminability of textural surfaces for use in areal differentiation. Unpublished doctoral dissertation, University of Washington, 1958.

Nolan, C. Y. Roughness discrimination among blind children in the primary grades. _Int. J. Educ. Blind_, 1960, 9, 97-99.

Footnote

1. Much of the material presented in this paper is taken from a MA thesis completed by the senior author at the University of Louisville under the direction of Dr. Raymond A. Kemper, 1960.